

OVERVIEW OF DEEPWATER BOTTOMFISH FISHERIES AND CURRENT MANAGEMENT ACTIVITIES IN PACIFIC ISLAND COUNTRIES AND TERRITORIES

Introduction

During the 1970s, the South Pacific Commission (now Secretariat of the Pacific Community – SPC) became involved in assessing and promoting what was termed “deep reef slope fisheries” as an alternative to fishing on or within shallow reefs. SPC’s efforts coincided with other activities sponsored by the UN Food and Agriculture Organization, and overseas donors in Samoa and elsewhere, that encouraged the expansion of fisheries beyond shallow reef areas. Many deep reef slope fish, such as *Etelis* and *Pristipomoides*, were known or found to be free of ciguatera and thus held export potential.

From 1974 to 1988, SPC masterfishermen undertook survey fishing in 19 of the 22 member SPC Pacific Island countries and territories (PICTs), with Guam, Nauru and Pitcairn being the only locations not included.

Commercial fisheries for deep reef slope species eventually became established at various times in Samoa, Tonga, Fiji, Vanuatu, Papua New Guinea and American Samoa (Dalzell and Adams 1994). It is worth noting that in many PICTs, deepwater bottomfish often comprised a catch component of deep reef slope fisheries, but were not always the sole target. In fact, in an exhaustive review of SPC’s

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bottomfish activities, it was reported that over 200 species of fish belonging to 93 genera were caught by SPC masterfishermen by dropline fishing throughout the Pacific Islands (Dalzell and Preston 1992).

More recently, changes to resource availability and the economic viability of the tuna longline fishery in some PICTs have raised the potential for renewal or increases in activity in deepwater bottomfish fisheries. Several PICTs have requested SPC’s assistance in undertaking investigations that could lead to renewed stock assessments and management interventions.

As a result, SPC commissioned a study during the latter half of 2009 to provide an overview of the current management framework for commercial deepwater bottomfish fisheries¹ in several PICTs. The work, undertaken by the author of this article, also included a short review of the deepwater bottomfish market in Hawaii, as that location has been an important one in the past for several PICTs, and fish prices there are often used as a reference point for deepwater bottomfish fisheries in PICTs.

Background

Past analyses of deepwater bottomfish data — from primarily SPC Fisheries Programme activities — have produced some conclusions that help to explain the parameters of the fishery on a region-wide basis:

- Catch composition was markedly different between low-lying atolls and high islands, with atoll catches containing proportionately fewer eteline (including *Etelis* and *Pristipomoides*) and other snapper species than high island catches.
- Mean catch rates by weight increased with sea depth to about 250 m but declined significantly below that depth.
- There was a distinct decline in the number of species captured by dropline fishing at each location from the western limit of fishing around Palau to the eastern limit of French Polynesia. This decline in species number is consistent with biogeographic trends in other fishes and invertebrate groups within the region.

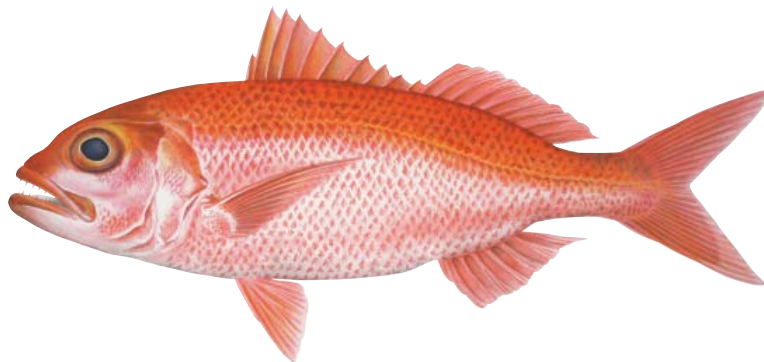
The implications of slow growth and longevity for catch rates in virgin and developed fisheries targeting deepwater bottomfish have been clearly demonstrated by results from several such fisheries in the region. New fisheries or locations for deepwater bottomfish initially experience high catch rates and tend to capture larger individual fish; but this characteristic disappears in a relatively short time depending on the unexploited biomass.

Current deepwater bottomfish fishing activity

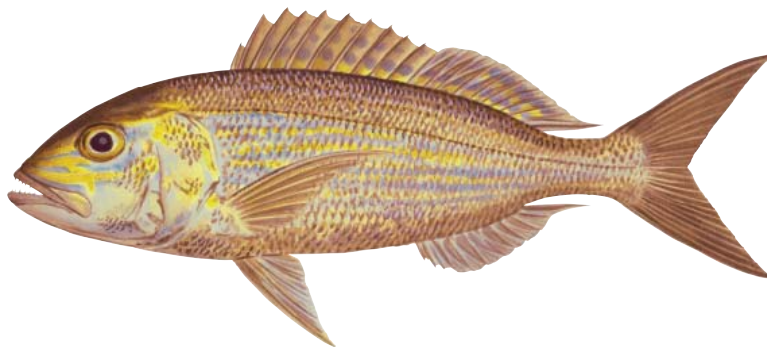
The paucity of available data from many PICTs on both catch and effort makes it difficult to quantitatively support



Etelis coruscans (flame snapper)
Artwork Les Hata, ©Hawaii DAR



Etelis carbunculus (ruby snapper)
Artwork Les Hata, ©SPC



Pristipomoides multidens (goldbanded jobfish)
Artwork Les Hata, ©SPC



Pristipomoides filamentosus (crimson jobfish)
Artwork Les Hata, ©Hawaii DAR

Figure 1. Four major species of deep bottom snappers in the Pacific Islands.

contentions of any significant trends on a regional basis. On a country-by-country basis, available information points towards some increases in commercial deepwater bottomfish landings in American Samoa and the Commonwealth of the Northern Mariana Islands.² Decreases in either fishing activity and/or landings are apparent in five countries: Fiji, Guam, Papua New Guinea, Samoa and Tonga. In five other countries — Federated States of Micronesia, Marshall Islands, Nauru, Niue and Tuvalu — fisheries officials indicated that no commercial deepwater bottomfish activity took place in 2008. Insufficient or no information is available to determine trends in deepwater bottomfish activity from the remaining PICTs.

In Samoa, a country that in some respects pioneered deepwater bottomfishing on its outer reef slopes during the 1970s, the reduced effort in the fishery is ascribed to a combination of factors. Perhaps the one factor with the most impact has been the resurgence of the tuna longline fishery in recent years. Vessel owners among the local alia fleet are reportedly more likely to invest in tuna longlining because returns from that fishery are perceived as being much higher than with bottomfishing. Some alia, probably five to ten at most in the entire country, still practice bottomfishing; but fishermen are more likely to target emperors (lethrinids) present at shallower depths than the deepwater *Etelis* or *Pristipomoides* species. The major reasons given are the lack of an export market due to poor flight connections, the ability to continue to catch sufficient quantities of the more shallow-water species, and the absence of a premium paid for deepwater species on the local

market to justify the added effort required.

In Tonga, the 2000 decade started with vessels being “reasonably profitable” according to the one major buyer and exporter. Total production in 2008 suffered because one entire company fleet was idle. Those vessels were back in operation in 2009 and production is reportedly increasing. One vessel operator who recently departed the fishery expressed the opinion that the present Tongan fleet is quite old and requires renewal if production is to be maintained. The present low profitability of the fishery and poor business conditions in Tonga are preventing this renewal from occurring. Present low profitability suggests that a rapid increase will not occur in the near future.

In two of the five PICTs where a decreasing trend is apparent, Fiji and Tonga, one identified contributing factor has been the reduced or stagnant prices overseas for deepwater bottomfish exports in the face of rising operating costs. In the case of Tonga, the negative

impact of low prices has been compounded by a drop in catch rates and an apparent reduction in the average size of fish caught (Adams 2007).

The perception that high export prices could be achieved for deepwater bottomfish has been a driving force for the development of these fisheries in several countries. In some cases failure of export activities has been due to insufficient examination of market conditions, including:

- seasonal market demand;
- freight costs and the logistical problems of getting fish to market;
- species preferences by specific markets; and
- competition from other sources of supply with the same or similar species.

In other cases the export market was developed but its performance did not keep pace with increasing fishing and air freight costs. Contributing to the problems have been falling catch rates as resources either became depleted or the fishery matured, and catch rates subsequently stabilized at levels below those required for profitability.

The market for fresh deepwater snapper and grouper in Hawaii

Hawaii has been a major destination for much of the exports of deepwater bottomfish from several PICTs. Imports into Hawaii from the South and Western Pacific (including Indonesia) during 2002–2006 averaged 341 metric tonnes (t) per annum, representing over half of the total supply of bottomfish in Hawaii’s fresh seafood market. It is known that some importers have forwarded quantities of bottomfish imports on to the US west coast, but the amounts are thought to be small.

The primary sources of the bottomfish supply in Hawaii in recent years have been Tonga, Indonesia and New Zealand. In the past, Fiji and, to a lesser extent, Samoa exported bottomfish to Hawaii. A nuance of the market sometimes not fully appreciated by operators desiring to export is that market demand is seasonal and the highest demand and prices occur in just a few months, December and January being the highest. For example, in 2007, the last

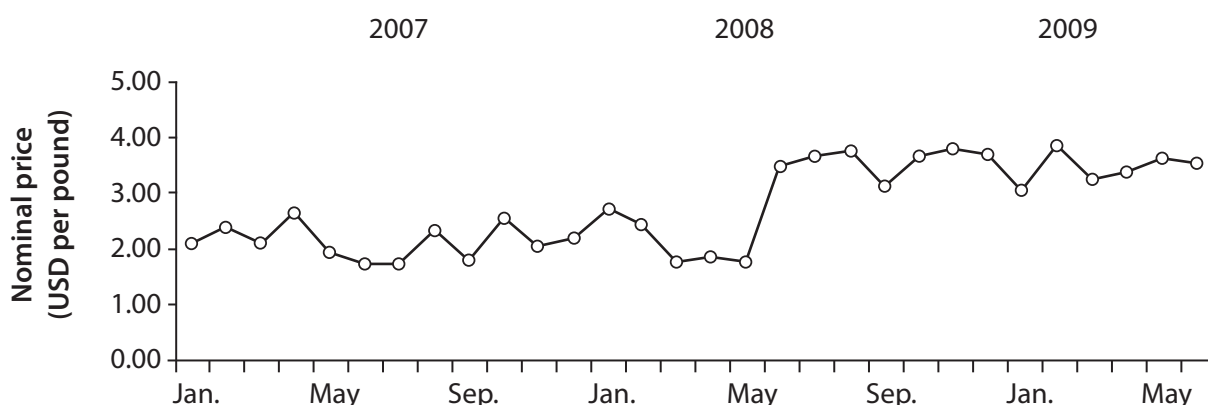


Figure 2. Nominal prices for fresh snapper and grouper imports to Honolulu, January 2007–June 2009. Source: Division of Aquatic Resources, Hawaii Department of Land and Natural Resources.

year for which comprehensive price data are available, prices varied for *E. coruscans* caught in Hawaii, from a high of USD 8.12 per pound (USD 17.90 per kg) in December, to a low of USD 4.45 per pound (USD 9.81 per kg) in June. Other factors such as the number of tourists and overall health of Hawaii's economy play important roles in demand and prices for deepwater bottomfish during this and other periods during the year.

This demand in Hawaii does not necessarily translate into higher prices for imports, however. It must be remembered that the market there is highly sensitive to fish quality, and in spite of the reputation of deepwater bottomfish maintaining their quality over time, it is very difficult for imports to command the prices paid for domestic supplies. This is assumed to be because of the distances and transit times involved, but biases towards local supply cannot be ruled out.

Information published by the State of Hawaii's Division of Aquatic Resources shows that import prices averaged around USD 2.00–4.00 per pound (USD 4.41–8.82 per kg) during 2007–2009 with little seasonal variation (Fig. 2). Prices for Hawaii-caught deepwater bottomfish averaged USD 5.81 per pound (USD 12.81 per kg) for *P. filamentosus* and USD 7.16 per pound (USD 15.78 per kg) for *E. coruscans* during the same period.

Due to concerns over the state of the resource, Hawaii has instituted a management system that closes the fishery once a total allowable catch (TAC) for seven deepwater species is reached. The TAC is adjusted on the basis of ongoing research for each "fishing year", which begins on 1 September. The 2009–2010 TAC for the main Hawaiian Islands was set at 254,050 pounds, or about 115 t, resulting in the closure of the fishery beginning 20 April 2010 lasting until 31 August 2010 when a new TAC will be implemented.

The impacts of such closures on import levels have been mixed. The first closure, from May–September 2007, resulted in an historical high for bottomfish imports into Hawaii, with 62% of the market supply during 2007 coming from imports. A second closure occurred in May 2008 but the volume of imports was greatly reduced from the previous year (Fig. 3). Overall, TAC levels have increased 30% in the three periods since they were introduced. Recent economics research has shown that increases in TAC levels will decrease prices and this may result in fishery revenues declining (Hospital and Pan 2009).

Why some deepwater bottomfish fisheries have ceased

As early as 1992, reasons were identified for the demise and/or lack of interest in continuing deepwater bottomfish fisheries in those countries where they had been established (Dalzell and Preston 1992). That analysis

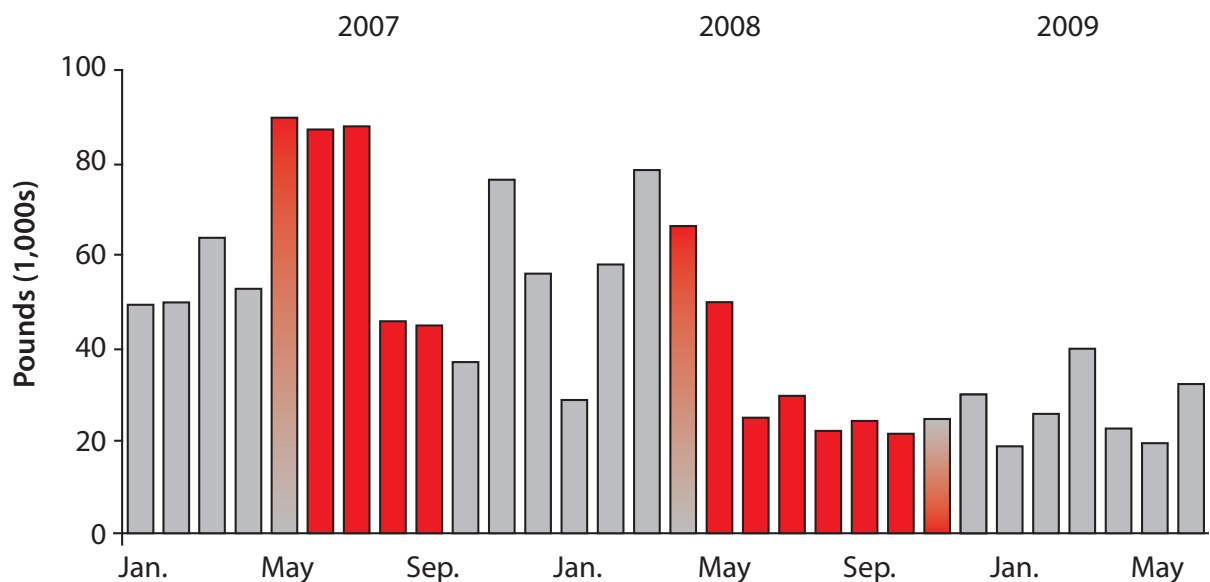


Figure 3. Deep bottomfish imports to Honolulu market. Red denotes closure periods for main Hawaiian Islands deepwater bottomfishing.

Source: Division of Aquatic Resources, Hawaii Department of Land and Natural Resources.

rings true 18 years later as one views the current situation in many PICTs. In general, the major causes identified were:

- limited productivity linked to habitat;
- decline of catch rates once virgin stocks were depleted;
- overcapitalisation through government subsidies;
- need for direct airline connections to high value export markets;
- problems with delays in payments even when airline connections existed; and
- interest in developing tuna longlining because of its greater economic potential.

Three additions to the above list that have become evident during efforts at developing deepwater bottomfish fisheries (even when the foregoing were or should have been known) are:

- lack of a significant price premium to encourage fishers to target deepwater bottomfish and expend the extra effort and costs involved;
- attempts at development schemes that were overly optimistic in production estimates, lacked current information on export markets, and/or did not take into account major bottlenecks of transportation and other logistics considerations; and
- removal of subsidies or financial support from donors.

Why some deepwater bottomfish fisheries have continued

A primary reason for those fisheries still in operation (Tonga and Fiji being two of the more significant locations) is the existence of sufficient habitat to support considerable deepwater bottomfish stocks. It is no coincidence that both countries possess seamount fisheries and do not rely solely on deep outer

slope habitats. This has enabled a dispersal of fishing effort and opportunities for alternative fishing areas. Other reasons that have contributed to the ability to maintain production in these fisheries, if at reduced levels, are primarily economic in nature:

- reasonable airline connections to export markets;
- emergence of local buyers and exporters that reduce marketing risk;
- lack of alternative fishery opportunities;
- existence of a large domestic market, including tourism (Fiji); and
- diversification by some companies that has allowed them to remain economically viable during periods of poor economic performance of the deepwater bottomfish fishery.

Management of sustainable deepwater bottomfish fisheries in PICTs

Responses to a questionnaire circulated to PICTs as part of the study indicate that four PICTs have specific management arrangements in place that pertain to deepwater bottomfish, with three of those being US-affiliated territories and the fourth being Tonga. An additional three PICTs have existing coastal fishery management arrangements that, in general, cover or could cover deepwater bottomfish. Ten PICTs reported having neither specific deepwater bottomfish management arrangements in place nor other management arrangements that would apply specifically to the resource. The situation has not changed all that much from what was reported in 2004, when SPC's Marine Resources Division presented a paper to the Heads of Fisheries meeting that provided a short overview of deepwater snapper fisheries in the

SPC region (Adams and Chapman 2004). Progress has been made in Tonga, however, with the completion of its deepwater snapper and grouper management plan, and at least two provinces in Papua New Guinea have produced draft plans.

Data collection on deepwater bottomfish fisheries in PICTs seems to work well when the activities are part of an overall fisheries monitoring scheme. The nature of the resources and bottomfishing in general (not just that targeted at deepwater species) make it practical to integrate data collection on deepwater species along with collection of data from other bottomfishing activities.

The objective of collecting data for stock assessment purposes is to determine sustainable yields. Catch monitoring is the obvious means by which this can be accomplished, but other activities such as tagging or otolith sampling (from both adults and juvenile specimens) can contribute to overall knowledge of the resource. Such activities other than catch monitoring would be most appropriate where resource use justifies the effort and the activities are within the capacity of fisheries departments to undertake.

As a basis, data collection for deepwater bottomfish stock assessment purposes should be part of a well-designed program that is within the available human and financial resources of the agency concerned to undertake and sustain. At a minimum, the data collected should reflect:

1. Estimates of total catch broken down by species, in number and/or weight.
2. Estimates of effort, such as vessel-day fishing, trips, or other consistent measure.

3. Fishing location as specifically described as possible (e.g. fine-scale global positioning system readings such as those that might be entered into a logbook or inferred from a vessel monitoring system and keyed to a map of fishing areas).
4. Size sampling data by species, accompanied by fine-scale location if possible. Where possible, both length and weight measures should be collected through sampling to develop length-weight relationships.

The data collected from the use of deepwater bottomfish resources on seamounts are essentially the same, but with even greater emphasis on the need for the data to be location-specific and not aggregated. Catches from individual seamounts can be used as a tool to detect patterns, and length frequency data by species are important. There still remains the unanswered ecological question of deepwater bottomfish population connectivity between seamounts, and this calls for careful collection of the data linked to specific seamount locations.

For those PICTs where data have been generated from past collection programs or assessments, it is useful to have those data available as well as the results from the assessments themselves. This is not always an easy task, as past data may not be easily located or be in electronic formats no longer used. This argues for even more care when designing and executing new data collection programs aimed at stock assessment that may be useful in future or related work.

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1. Deepwater bottom fishing is considered here to be fishing for bottom dwelling species using a multi-hook terminal rig in depths greater than about 100–120 m (Preston et al. 1999). Vertical droplines or handlines are the most common gear types employed, although it is acknowledged that there may be or have been some activities using longlines set on or just above the bottom.
2. Available commercial landings data for the Commonwealth of the Northern Mariana Islands and American Samoa apply to 2004 and 2007.